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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,488	10/18/2004	Dan Zhou	UCF-294DIV	3162

23717 7590 02/21/2008
LAW OFFICES OF BRIAN S STEINBERGER
101 BREVARD AVENUE
COCOA, FL 32922

EXAMINER	
PATEL, TAYAN B	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
02/21/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/699,488	ZHOU ET AL.	
	Examiner	Art Unit	
	TAYAN PATEL	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *8-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/3/2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/03/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 8 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (US 6838297) in view of Urayama et al (US 6650061) in view of Weinberg et al (US 6638413).

Regarding claim 8, Iwasaki et al describes an apparatus for producing nanostrucutres/nanotubes (See column 1, lines 12-13) comprising: (i) a temperature controlled electrochemical bath, 60, of electrolyte, 63, in a reaction vessel/container, 64, an electrode/substrate, 11, and a cathode, 62 (See column 7, lines 38-52; See also figure 6). Examiner identifies the organic solution of methanol and benzyl alcohol not further defining the structural limitations of the container (See MPEP 2113 – Apparatus

& Article Claims --- Functional Language). Iwasaki further discloses the formation of nanotubes (See column 1, lines 11-19), yet fails to explicitly disclose coating the electrodes, anode and cathode, with catalytic nanoparticles of iron and nickel in said container.

Urayama et al describes the formation of carbon nanotubes (See column 6, lines 22-50) wherein the conductive layer, 2c, of the electrode wire, 2, can be iron and nickel in order to facilitate lower processing temperatures and selective growth provided by the catalytic action (See column 6, lines 27-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the conductive layer in Urayama et al for coating the electrodes of Iwasaki et al in order to facilitate lower processing temperatures and selective growth provided by the catalytic action.

Iwasaki et al further describes an electrochemical cell (See abstract) but modified Iwasaki et al fails to expressly describe a power supply for imposing a direct current of approximately 1000 volts.

Weinberg describes an electrochemical cell (See column 2, lines 1-16) wherein 1000 volts of direct current are applied to the cell in order to provide short pulse durations (See column 9, lines 50-67). Regarding the claim beginning with "to grow and deposit..." the limitations are functional and do not impart further structure to the claimed invention (See MPEP 2114).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the power supply in Weinberg et al in the apparatus of modified Iwasaki et al in order to provide short pulse durations.

Regarding claims 10-11, modified Iwasaki et al describes all of the claimed limitations of claim 8 above, wherein the production of nanotubes having a specified diameter and length under ambient conditions in an organic solution does not impart further structure on the apparatus. See MPEP 2113.

Regarding claim 12, modified Iwasaki et al describes all of the claimed limitations of claim 8 above, wherein the deposition of carbon nanoparticles on the anode and cathode coated with catalytic nanoparticles of iron and nickel is does not impart further structure to the apparatus. See MPEP 2113.

4. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (US 6838297) in view of Urayama et al (US 6650061) in view of Weinberg et al (US 6638413) as applied to claim 1 above, and further in view of Bell (US 4310393).

Regarding claim 9, Iwasaki further discloses an electrochemical system with voltage, a catalyst and electrolyte (See column 7, lines 38-65), yet modified Iwasaki fails to discuss a current density of approximately 12 milliamps per square centimeter between the electrodes.

Bell discloses an electrochemical process containing a catalyst, direct current (voltage supply required as a power supply for current) and electrolyte (See column 1, lines 30-38) where current densities range from about 1-1000 milliamps per square

centimeter between the anode and cathode in order to provide adequate current between the surface area separating the two electrodes (See column 4, lines 16-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was claimed to use the current density in Bell in the apparatus of modified Iwasaki et al in order to n order to provide adequate current between the surface area separating the two electrodes.

5. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (US 6838297) in view of Urayama et al (US 6650061) in view of Weinberg et al (US 6638413) in view of Bell (US 4310393).

Regarding claim 13, Iwasaki et al describes an apparatus for producing nanostrucutres/nanotubes (See column 1, lines 12-13) comprising: (i) a temperature controlled electrochemical bath, 60, of electrolyte, 63, in a reaction vessel/container, 64, an electrode/substrate, 11, and a cathode, 62 (See column 7, lines 38-52; See also figure 6). Examiner identifies the organic solution of methanol and benzyl alcohol not further defining the structural limitations of the container (See MPEP 2113 – Apparatus & Article Claims --- Functional Language). Iwasaki further discloses the formation of nanotubes (See column 1, lines 11-19), yet fails to explicitly disclose coating the electrodes, anode and cathode, with catalytic nanoparticles of iron and nickel in said container.

Urayama et al describes the formation of carbon nanotubes (See column 6, lines 22-50) wherein the conductive layer, 2c, of the electrode wire, 2, can be iron and nickel

in order to facilitate lower processing temperatures and selective growth provided by the catalytic action (See column 6, lines 27-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the conductive layer in Urayama et al for coating the electrodes of Iwasaki et al in order to facilitate lower processing temperatures and selective growth provided by the catalytic action.

Iwasaki et al further describes an electrochemical cell (See abstract) but modified Iwasaki et al fails to expressly describe a power supply for imposing a direct current of approximately 1000 volts.

Weinberg describes an electrochemical cell (See column 2, lines 1-16) wherein 1000 volts of direct current are applied to the cell in order to provide short pulse durations (See column 9, lines 50-67). Regarding the claim beginning with "to grow and deposit..." the limitations are functional and do not impart further structure to the claimed invention (See MPEP 2114).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the power supply in Weinberg et al in the apparatus of modified Iwasaki et al in order to provide short pulse durations.

Iwasaki further discloses an electrochemical system with voltage, a catalyst and electrolyte (See column 7, lines 38-65), yet modified Iwasaki fails to discuss a current density of approximately 12 milliamps per square centimeter between the electrodes.

Bell discloses an electrochemical process containing a catalyst, direct current (voltage supply required as a power supply for current) and electrolyte (See column 1,

lines 30-38) where current densities range from about 1-1000 milliamps per square centimeter between the anode and cathode in order to provide adequate current between the surface area separating the two electrodes (See column 4, lines 16-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was claimed to use the current density in Bell in the apparatus of modified Iwasaki et al in order to n order to provide adequate current between the surface area separating the two electrodes.

Regarding the final limitation, beginning with "a nanotube produced from the organic solution" no further structure is imparted onto the apparatus, thus does not further limit the apparatus claim. See MPEP 2113.

Regarding claims 14-17, the makeup of the organic solution or the ambient conditions do not impart further structure to the apparatus, thus does not further limit the apparatus claim. See MPEP 2113.

Response to Arguments

Applicant's arguments with respect to claims 8-11 have been considered but are moot in view of the new ground(s) of rejection. The arguments with respect to the functional additions, particularly relating to the organic solution, ambient condition, and ability to grow and deposit carbon nanoparticles are functional limitations that do not impart further structure to the apparatus as claimed. Regarding the new rejections, Weinberg et al (US 6638413) was added to overcome the limitation of a direct current

applying of 1000 volts. Applicant is requested to view the rejections above, *supra*, as well as the response to arguments, *infra*.

IDS

The IDS filed 18 October 2004 has not been reviewed. However, IDS filed 04 December 2007 is compliant with 37 CFR 1.98(a) (1), thus will be considered and made of record.

35 USC 103

I. **Regarding claim 8, Iwasaki et al does not provide for the growth and deposition of nanoparticles during an electrochemical reaction that takes place in a liquid phase under ambient conditions.**

In response, Examiner contends that the structural limitations of modified Iwasaki et al cover the structural limitations of Applicant's invention. Moreover, the functional language recited by Applicant does not impart further structure to the apparatus as claimed.

II. **Regarding claim 8, the nanostructure in Iwasaki et al obtained by anodizing aluminum would not produce carbon nanoparticles.**

In response, Examiner contends that the structural limitations are met by modified Iwasaki et al, thus it would be obvious that the apparatus would be able to perform the functions of producing carbon nanoparticles.

III. **Regarding claim 8, the electrolyte in Iwasaki et al is not organic.**

In response, Examiner contends that the electrolyte used in Iwasaki, whether organic or inorganic, does not impart further structure on the vessel/container. Thus, modified Iwasaki et al covers the limitations of the apparatus claim.

IV. **Regarding claim 8, Iwasaki et al does not recite ambient conditions or direct current but rather.**

In response, Weinberg et al was introduced for its direct current of 1000 volts. As to ambient conditions, it does not impart further structure to the vessel, thus does not limit the apparatus claim.

V. **Regarding claim 8, Urayama does not dicuss the formation of nantubes in the citation provided**

In response, Examiner admits that the citation was a typographical error. The corrected citations are listed in claim 8 above.

VI. **Regarding claim 8, it would not have been obvious to combine Iwasaki and Uruyama becaus Uruyama describes a CVD procee to produce carbon nanotubes.**

In response, Examiner contends that Urayama et al was introduced for providing the conductive layer on the electrodes. Thus, the manner in which nanotubes are

produced is irrelevant because the primary reference, Iwasaki et al, covers this limitation.

On another note, because the claimed invention is for an apparatus, the production of nanotubes is irrelevant so long as the limitations of the apparatus are available. In this case, modified Iwasaki covers all of the claimed limitations.

VII. **Regarding claim 9, Bell is not analagous to the preparation of carbon nanoparticles in an electrochemical reaction apparatus using an organic solvent in ambient conditions.**

In response, Examiner contends that the references are analogous because they fall within the realm of electrochemical technology comprising cells. As such, the current density provided from the Bell reference is justified for being combined with modified Iwasaki et al.

VII. **Regarding claim 9, neither Iwasaki et al in view of Urayama et al nor in view of Bell render obvious the use of an electrochemical cell reaction and apparatus to prepare carbon nanoparticles from an organic liquid at ambient temperatures and pressures.**

In response, Examiner contends that it would be obvious to combine the references because they are analogous, as illustrated in response VII, *supra*. In addition, the combined references address all of the structural limitations of the claimed invention. Because organic liquid at ambient temperature and pressures does not impart further structure, the combined references are obvious over the claimed invention.

IX. **Regarding claims 10-11, a person of ordinary skill in the art would not have found it obvious to use laser vaporization, as provided in Smalley et al, suggestive or instructive in the production of carbon nanoparticles using Applicant's apparatus.**

In response, Examiner sees the logic in Applicant's argument. However, the claims has been amended so there is no further structural limitations recited in these claims. Thus, Smalley has been withdrawn as a reference and the claims are rejected off modified Iwasaki et al as applied to claim 8.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TAYAN PATEL whose telephone number is (571)272-9806. The examiner can normally be reached on Monday-Thursday, 8 AM-6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Tayan Patel, Esq./

Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795